



Exploring the World of Science

Test Packet Division B 2016

Division B (Gr. 6-9)

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2015 Science Olympiad National Tournament

Master Score Report Division B

#	School Name (State)	Air Trajectory	Anatomy and Physiology	Bio-Process Lab	Bottle Rocket	Bridge Building	Cant. Judge A Powder	Crave the Wave	Crime Busters	Disease Detectives	Dynamic Planet	Elastic Launched Gliders	Entomology	Experimental Design	Fossils	Green Generation	Meteorology	Picture This	Road Scholar	Robo-Cross	Simple Machines	Solar System	Wheeled Vehicle	Write It Do	Sumobots (T/P)	GPS (T/P)	Roller Coaster (T/P)	Science Bowl (T/P)	Team Penalties	Total Team Points	Final Team Rank	
13	Solon M.S. (OH)	5	2	9	8	4	3	1	10	5	3	6	11	9	2	14	2	15	14	9	3	7	6	4	61	61	25		152	1		
19	Beckendorff J.H.S. (TX)	11	9	26	4	10	16	5	2	9	11	8	21	8	1	8	12	2	6	3	5	3	13	1	4	13	11	21	194	2		
2	Winston Churchill M.S. (CA)	38	8	7	20	9	20	2	27	20	9	24	5	7	3	7	5	16	4	18	4	19	3	10	16	60	7	24	285	3		
3	Piedmont IB M.S. (NC)	3	19	10	7	12	39	10	4	15	4	25	28	5	24	4	3	29	11	2	1	1	38	2	61	61	19	3	296	4		
9	Daniel Wright J.H.S. (IL)	14	16	13	54	1	8	12	3	1	29	3	18	1	4	17	49	9	5	12	10	9	2	9	19	60	4	8	299	5		
10	Marie Murphy (IL)	27	17	2	12	29	38	24	5	6	13	2	4	15	8	5	16	21	7	5	12	14	9	17	61	61	40	308	6			
31	Longfellow M.S. (VA)	25	5	15	9	17	5	11	7	30	22	22	25	3	20	16	32	6	13	20	2	5	8	7	2	3	20	1	325	7		
1	Muscate M.S. (CA)	45	25	5	1	3	4	17	1	16	23	9	6	6	14	3	8	12	1	24	36	13	25	30	5	61	2	28	327	8		
5	Meads Mill M.S. (MI)	10	10	18	6	14	25	18	14	3	1	5	9	2	7	23	7	3	8	50	35	17	14	29	26	60	24	19	328	9		
7	Paul J. Gelinas J.H.S. (NY)	8	11	11	28	36	12	20	12	4	10	4	1	21	11	29	1	34	3	21	24	12	32	3	1	8	6	2	348	10		
11	Springhouse M.S. (PA)	2	4	1	30	16	17	7	11	37	20	11	23	10	34	1	9	8	20	14	7	30	44	6	61	61	40	362	11			
6	Lakeshore M.S. (MI)	4	32	20	14	5	21	27	16	11	12	10	19	22	23	18	14	22	24	16	19	27	10	24	11	14	13	8	410	12		
17	Ladue M.S. (MO)	37	1	24	17	32	22	8	30	21	25	18	2	12	15	20	10	17	15	40	9	42	1	16	9	61	12	10	434	13		
8	Eagle Hill M.S. (NY)	9	18	19	10	42	2	41	8	40	14	29	34	4	13	10	11	13	2	45	26	4	17	32	61	61	40	443	14			
18	Pembroke Hill M.S. (MO)	22	26	23	38	20	14	3	15	8	2	46	17	19	21	30	21	14	21	6	11	11	23	42	61	61	40	453	15			
12	Shady Side Academy M.S. (PA)	7	30	16	25	18	9	30	19	34	16	17	12	26	27	33	6	19	22	7	8	21	49	18	15	7	61	34	469	16		
44	Chippewa M.S. (MN)	1	7	12	26	31	10	6	38	2	19	38	7	34	29	9	36	10	18	19	27	15	52	57	24	1	27	6	503	17		
26	Auburn J.H.S. (AL)	15	3	14	2	2	44	13	24	10	34	19	16	13	32	21	20	48	10	4	29	37	47	53	28	60	3	40	510	18		
15	Dodgen (GA)	19	42	8	34	8	18	9	35	19	18	16	10	16	35	13	31	40	40	11	18	10	19	45	17	60	14	25	514	19		
16	Fulton Science Academy (GA)	42	12	4	3	25	45	25	9	22	7	57	13	14	5	19	24	20	17	39	6	47	42	20	61	61	10	517	20			
27	Thomas Jefferson M.S. (IN)	35	38	29	23	19	28	39	20	12	38	47	22	17	9	27	42	5	23	1	39	6	4	11	61	60	61	25	534	21		
38	Pilgrimage Homeschool (MD)	28	46	17	35	11	7	19	17	23	45	7	20	11	30	32	35	32	12	23	23	46	18	8	61	5	61	40	545	22		
14	Memorial (OH)	17	36	33	5	21	15	45	25	24	33	27	35	24	18	11	29	51	26	17	20	20	7	23	61	61	16	36	562	23		
29	Preston M.S. (CO)	48	29	32	29	52	42	15	6	14	41	13	14	44	16	12	23	7	35	15	14	24	21	33	14	61	61	40	579	24		
34	Community M.S. (NJ)	43	13	40	16	7	59	14	48	17	36	1	26	37	6	24	27	11	25	42	25	23	35	19	61	61	8	6	594	25		
20	Cinco Ranch J.H.S. (TX)	24	15	27	31	24	40	23	41	45	17	40	32	18	19	6	15	47	32	8	16	26	41	15	61	61	35	602	26			
32	Hamilton M.S. (WI)	23	31	36	11	57	6	35	21	26	21	21	33	31	26	26	28	55	9	43	21	18	22	13	61	10	61	29	613	27		
4	JM Alexander M.S. (NC)	30	14	25	24	13	27	38	31	32	8	12	38	27	28	15	18	30	42	29	40	8	26	59	61	18	61	21	614	28		
43	Highlands Intermediate School (HI)	16	35	39	27	28	1	22	18	41	30	28	8	39	17	57	50	4	30	36	13	28	20	38	61	6	23	3	625	29		
39	Russell Independent M.S. (KY)	20	20	6	22	34	23	53	53	47	48	31	24	36	53	38	48	25	37	10	17	44	15	14	27	2	10	13	718	30		
28	Leawood M.S. (KS)	6	48	38	49	22	51	33	34	43	27	15	3	23	12	35	19	38	45	49	28	33	28	60	12	9	61	13	739	31		
36	HB duPont M.S. (DE)	41	34	28	39	6	13	34	22	28	52	45	43	38	38	55	4	37	31	57	22	50	16	21	7	4	1	38	754	32		
50	Bell Street M.S. (SC)	12	40	37	41	53	36	31	50	7	31	41	31	49	10	22	41	54	16	35	44	34	34	5	6	61	61	31	754	33		
21	Archimedean Middle Conservatory (FL)	29	44	43	33	45	52	4	42	42	15	33	30	29	31	43	45	1	53	48	15	2	55	52	18	61	26	19	786	34		
54	Hyde Park M.S. - Acad. of Sci. & Math (NV)	47	21	3	44	46	48	29	37	25	6	43	27	35	48	36	17	18	44	37	33	38	60	37	3	16	5	21	789	35		
37	A. W. Coolidge M.S. (MA)	36	50	49	46	41	19	21	13	38	46	23	46	28	25	28	39	31	41	46	31	22	40	31	25	61	22	13	790	36		
49	Stoller M.S. (OR)	52	49	21	50	40	49	28	51	35	5	34	50	33	49	2	26	27	55	26	57	25	29	28	61	61	5		821	37		
51	Bedford M.S. (CT)	53	23	54	13	30	11	42	28	39	49	36	47	42	55	45	34	44	19	30	49	43	11	34	61	61	28	40	831	38		
25	Northshore J.H.S. (WA)	13	39	35	42	49	46	49	29	31	56	54	42	41	39	31	37	43	28	22	34	31	48	22	20	61	61	17	861	39		
22	Orlando Science School (FL)	58	6	47	18	33	41	26	39	18	26	56	15	45	52	25	47	35	57	44	30	58	54	39	61	61	40		869	40		
56	Ames M.S. (IA)	60	33	55	55	44	26	46	55	29	39	14	39	32	41	39	33	33	39	27	32	49	12	41	61	61	17		873	41		
42	Fairfield J.H.S. (UT)	18	28	50	19	35	54	32	33	33	40	53	29	57	44	46	30	49	38	13	43	35	46	58	61	61	40		883	42		
23	Mission M.S. (NE)	50	43	48	52	51	24	16	26	44	42	32	36	40	40	40	50	51	26	36	31	46	29	24	50	13	61	61	40		887	43
33	Cedar Springs Home School (TN)	49	54	34	36	48	31	43	40	36	44	52	50	20	45	47	13	57	27	47	41	36	27	29	60	61	30		914	44		
53	Barrington M.S. (RI)	26	52	44	32	55	50	56	47	59	37	26	41	25	36	34	38	24	29	41	46	32	51	51	26	61	11	9	31	922	45	
35	Albuquerque Area Home Schoolers (NM)	33	37	45	53	54	55	55	58	13	59	48	45	43	22	44	22	39	33	34	37	40	43	12	61	61	40		924	46		
47	Casady School (OK)	34	22	22	37	38	33	48	44	27	24	50	51	48	54	37	40	28	49	59	48	48	45	44	8	61	61	12		930	47	
45	St. John Berchmans Catholic School (LA)	39	55	31	15	23	34	54	32	55	53	49	52	47	51	58	25	23	52													

DuPont Team Enterprise Award

2015 National Science Olympiad Tournament

This is an annual trophy for the best overall team performance, outside of the top 10 placing teams. To be eligible, teams may not have attended last year's National Tournament. This award recognizes a breakthrough performance by a team exhibiting the hard work required to not only make it to the national competition, but to succeed at a high level. This year there are 16 Division B and 17 Division C teams eligible.

Div	Team	Place
B	#16 Fulton Science Academy (GA)	20
C	# 14 Mentor High School (OH)	15

Team #	Team Name	Distance (mm)	Failed Launch (Y/N)	Distance (mm)	Failed Launch (Y/N)	Bucket Shot (Y/N)	Hits Bucket (Y/N)	Bottom Contact (Y/N)	Distance (mm)	Failed Launch (Y/N)	Distance (mm)	Failed Launch (Y/N)	Bucket Shot (Y/N)	Hits Bucket (Y/N)	Bottom Contact (Y/N)	# Plots (max 4)	Data Table (max 20)	Graph (max 20)	Match (max 20)	Labels (max 40)	# of Penalties	Tier (Y/N)	TB2: Mass (g)	CT1	CT2	FT1	FT2	Final Score	Rank
1	Muscate M.S. (CA)	623	104	1066	1176				4	20	20	20	40			0	4700	1377	1896	2934	2824	5230	45						
2	Winston Churchill M.S. (CA)	220	335	870	645				4	20	20	15	40			0	4200	1780	1665	3130	3355	5515	38						
3	Piedmont 1B M.S. (NC)	0		305		Y	Y	N	4	20	20	20	40			0	3200	2000	200	3695	0	6295	3						
4	JM Alexander M.S. (NC)	148		580	444				4	20	20	20	40			0	1300	1852	0	3492	5704	30							
5	Meads Mill M.S. (MI)	0		163			Y		4	10	20	20	30			0	4100	2000	200	3420	3556	6156	10						
6	Lakeshore M.S. (MI)	239	95	450	98				4	20	20	0	40			0	1600	1761	1905	3837	200	6262	4						
7	Paul J. Gelinas J. H. S. (NY)	305	47	270	195				4	20	20	20	40			0	4300	1695	1953	3550	3902	6175	8						
8	Eagle Hill M.S. (NY)	83	33	160		Y	Y	N	4	15	20	20	30			0	5000	1917	1967	3730	3805	6172	9						
9	Daniel Wright J.H.S. (IL)	180		45					4	10	20	20	40			0	5000	1820	0	3840	100	6100	14						
10	Marie Murphy (IL)	321		150	446				4	20	20	20	40			0	400	1679	200	3475	3554	5793	27						
11	Springhouse M.S. (PA)	110	0	150		Y	Y	N	4	20	20	20	40			0	2500	1890	100	3955	0	6345	2						
12	Shady Side Academy M.S. (PA)	65	0	208	N				4	20	20	20	40			0	1500	1935	0	3850	0	6185	7						
13	Solon M.S. (OH)	106	0	53					4	20	20	20	40			0	2000	1894	0	3792	3947	6241	5						
14	Memorial (OH)	180	1556	114					4	20	20	20	30			0	2600	1820	444	3886	0	6066	17						
15	Dodge (GA)	545	120	1823	258				4	20	20	20	40			0	2600	1455	1880	2177	3742	6022	19						
16	Fulton Science Academy (GA)	792	530	1472	512				4	20	20	20	40			0	4000	1208	1470	2528	3488	5358	42						
17	Ladue M.S. (MO)	550	390	430	513				4	20	20	10	40			0	2500	1450	1610	3570	3487	5540	37						
18	Pembroke Hill M.S. (MO)	155	0	441	237				4	10	20	20	40			0	4200	1845	0	3559	3763	5968	22						
19	Beckendorff J.H.S. (TX)	75		315	180				4	20	20	20	40			0	4600	1925	0	3685	3820	6145	11						
20	Cinco Ranch J.H.S. (TX)	265		1560	135				4	20	20	20	30			0	5000	1735	0	2440	3865	5960	24						
21	Archimedean Middle Conservatory (FL)	630	340	243					4	20	20	20	20			0	4500	1370	1660	3757	0	5737	29						
22	Orlando Science School (FL)	565	172	3846	3605				0	0	0	0	0			0	4700	1435	1828	154	395	2223	58						
23	Mission M.S. (NE)	590	657	926	1100				3	18	15	20	15			0	4000	1410	1343	3074	2900	4688	50						
24	Logan Fontenelle M.S. (NE)	970	80	270					4	10	10	20	20			0	4700	1030	1920	3730	100	5990	21						
25	Northshore J.H.S. (WA)	95		452	264				4	20	20	20	30			0	5000	1905	100	3548	3736	6101	13						
26	Auburn J.H.S. (AL)	108		2897	213				4	20	20	20	40			0	1600	1892	0	1103	3787	6079	15						
27	Thomas Jefferson M.S. (IN)	409		565	284				4	20	20	20	30	1			3300	1591	0	3433	3716	5567	35						
28	Leawood M.S. (KS)	120	Y	240					4	20	20	20	35			0	3600	1880	3760	200	6220	6							
29	Preston M.S. (CO)	1325	990	1100	405				3	20	20	20	40			0	4900	675	1010	2900	3595	4905	48						
30	Wachter M.S. (ND)	1260	2080		620				4	20	0	0	0			0	5000	740	0	3380	4200	54							
31	Longfellow M.S. (VA)	210	150	310	490				4	20	20	20	30			0	2900	1790	1850	3690	3510	5900	25						
32	Hamilton M.S. (WI)	55		345	545				4	20	20	20	30			0	4000	1945	0	3655	3455	5960	23						
33	Cedar Springs Home School (TN)	510	475	1090	1045				4	20	20	20	30			0	2200	1490	1525	2910	2955	4840	49						
34	Community M.S. (NJ)	1340	505	590	705				4	20	20	20	40			0	4800	660	1495	3410	3295	5305	43						
35	Albuquerque Area Home Schoolers (NM)	265	490	1060	510				4	20	20	20	30			0	1200	1735	1510	3150	3490	5585	33						
36	HB duPont M.S. (DE)	182		670	910				4	10	20	20	30	1			700	1818	0	3330	3090	5368	41						
37	A. W. Coolidge M.S. (MA)	385	250	550	650				4	15	20	20	30	0		0	4100	1615	1750	3450	3350	5540	36						
38	Pilgrimage Homeschool (MD)	265	N	510	N				4	20	20	20	40	0	N	0	1800	1735	0	3490	3655	5790	28						
39	Russell Independent M.S. (KY)	720	310	183	48				4	20	20	20	30	0		0	5000	1280	1690	3817	3952	6002	20						
40	Corvallis M.S. (MT)	1700	N	6150	3062				1	20	20	10	30	0		0	3500	300	0	938	1318	59							
41	Paragon Science Academy (AZ)	763	274	356	1419				4	10	20	20	30	0		0	2200	1237	1726	3644	2581	5690	31						
42	Fairfield J.H.S. (UT)	90	Y	400	240				4	15	20	20	40	0		0	2600	1910	1910	3600	3760	6050	18						
43	Highlands Intermediate School (HI)	145		178	431				4	20	20	20	40	0		0	1700	1855	0	3822	3569	6077	16						
44	Chippewa M.S. (MN)	0		195					4	20	20	20	30	0		0	1000	2000	200	3805	100	6465	1						
45	St. John Berchmans Catholic School (LA)	525	1111	155	232				4	0	20	0	20	0		0	4100	1475	889	3845	3768	5480	39						
46	Saint Patrick Catholic H.S. (MS)	3000	1135	2061	0				0	0	0	0	0	0		0	5000	0	865	1939	2804	57							
47	Casady School (OK)	260		1020	450				4	10	20	10	30	0		0	5000	1740	0	2980	3550	5570	34						
48	Teeland M.S. (AK)	1160	225	1300	765				3	20	20	20	35	0		0	4000	840	1775	2700	3235	5295	44						
49	Stoller M.S. (OR)	517	416	1503	1524				4	20	20	20	40	0		0	1800	1483	1584	2497	2476	4481	52						
50	Bell Street M.S. (SC)	99	530	748	154				4	20	20	20	30	0		0	4400	1901	1470	3252	3846	6107	12						
51	Bedford M.S. (CT)	770	660	2210	1450				4	15	20	20	30	0		0	4900	1230	1340	1790	2550	4230	53						
52	St. Joseph's Catholic (ID)	250		445					4	20	20	20	30	0		0	3300	1750	0	3555	0	5665	32						
53	Barrington M.S. (RI)	230	210	670	135				2	20	20	20	35	0		0	4800	1770	1790	3330	3865	5845	26						
54	Hyde Park M.S. - Acad. Of Sci. & Math (NV)	Y	277	900	3670				3	0	20	0	20	0		0	1200	1723	3100	330	4943	47							
55	Nettleton J.H.S. (AR)	Y	964	1410	1343				4	10	10	20	15	0		0	5000	1036	2590	2657	3913	55							
56	Ames M.S. (IA)	Y	Y	960	430				4	20	20	20	40	0		0	4800	0	1660	3040	3570	5450	40						
57	Riverton M.S. (WY)	4350	340	960	430				4	15	15	15	10	0		0	5000	1860	0	1460	1460	3700	56						
58	Yankton M.S. (SD)	140		2540	2540				4	20	20	20	35	0		0	3200	95	620	910	3690	4670	51						
59	Medomak M.S. (ME)	1905	1380	3090	310				4	20	20	20	30	0		0	1900	95	1250	3070	3605	4950	46						
60	Huntington M.S. (WV)	1905	750	930	395				1	15	20	20	40	0		0													

Anatomy and Physiology - B Division

National Science Olympiad State Competition May 16, 2015

Team Members: _____

School Name: _____

Integumentary System

1. Skin makes up what percentage of body weight? (1 pt.)

2. Name and describe all layers of epidermis. (10 pts.)

3. What is the stratum corneum, and what type of cell is it made of? (2 pts.)

4. What is the main protein responsible for skin strength and elasticity? (1 pt.)

5. What are the three major cell types found in the dermis? (3 pts.)

6. What are the five types of psoriasis? (5 pts.)

7. What type of cell is infected by human papillomavirus? (1 pt.)

8. Name two types of modified apocrine glands in the skin. (2 pts.)

Tie-Breakers:

Which four types of human papillomavirus cause a large number of cervical cancer cases? (up to 4 pts.)

What are three major symptoms of psoriasis?

Immune System

1. Matching: (Items I through V may be used more than once.) (13 pts.)

I. neutrophils II. monocytes III. eosinophils IV. platelets V. basophils

- a. Produced from megakaryoblasts.
- b. Phagocytose antigen-antibody complexes.

- c. Able to kill certain larval parasitic worms.
 - d. Largest leukocyte.
 - e. A cell fragment.
 - f. Leave blood vessels and transform into macrophages.
 - g. Nonnucleated structures.
 - h. Least abundant leukocyte
 - i. Contain ADP and thromboplastin A2.
 - j. Granules have an affinity for acidic stains
 - k. Some of the contained granules contain heparin
 - l. Granules have an affinity for basic stains
 - m. Also called thrombocytes
2. What are mast cells? Describe their function. (3 pts.)
3. What are the major differences between the innate and adaptive immune systems? (5 pts.)
4. What are the anatomical barriers of the innate immune system? What components of these systems help protect against infection? (8 pts.)
5. What is autoimmunity? (2 pts.)
6. What is erythrocyte sedimentation rate (ESR)? (1 pt.)

7. Match the terms below to their proper definitions. (6 pts.)

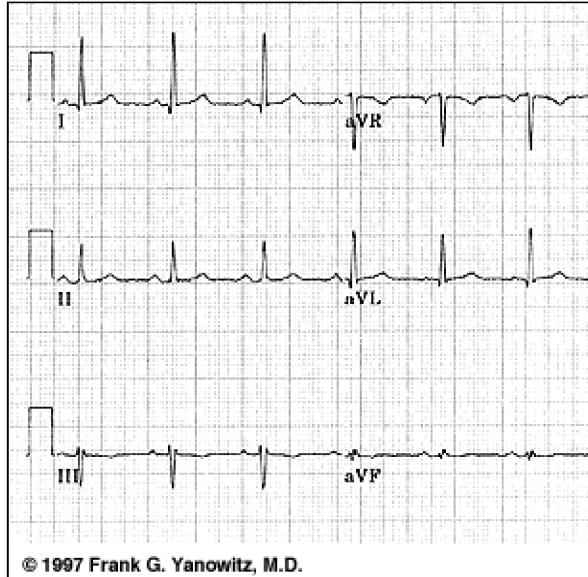
	complement	A.	particle or substance the immune system sees as foreign
	histamine	B.	proteins produced by plasma cells which have affinity for antigens
	interferons	C.	fluid recovered from tissues that is filtered by lymph nodes
	antigen	D.	proteins produced by liver which may be activated by antigens
	lymph	E.	proteins produced by virally infected cells that activate healthy cells
	antibody	F.	primary inflammatory chemical released by activated mast cells

8. What autoantibodies are found in a majority of patients with coeliac disease? (1 pt.)

Tie-Breaker: What are the secondary causes of T-cell deficiency?

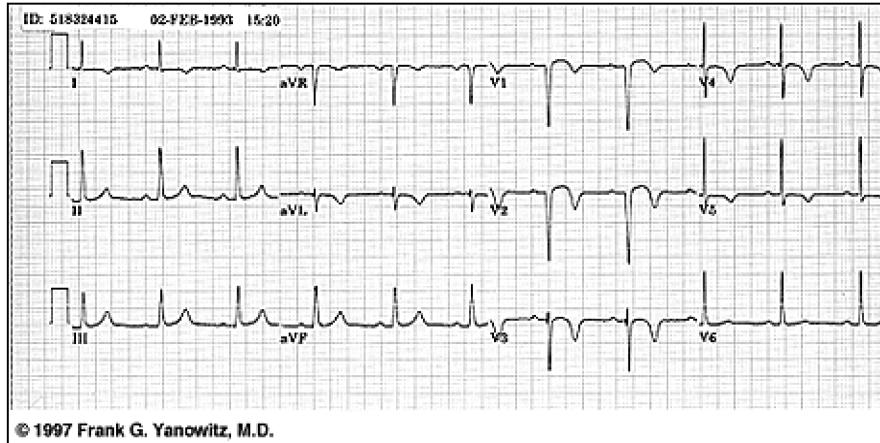
Cardiovascular System

1. What is the correct diagnosis of this ECG? (1 pt.)



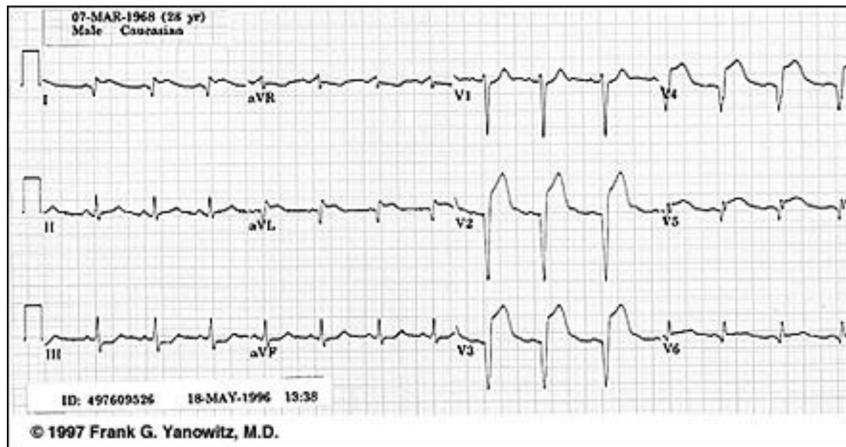
- A. Anterolateral MI
- B. High lateral MI
- C. True posterior MI
- D. Inferolateral MI
- E. Inferior MI

2. What is the correct diagnosis of this ECG? (1 pt.)



- A. Anteroseptal MI
- B. Anterior MI
- C. Posterior MI
- D. Posterolateral MI
- E. Right ventricular MI

3. What is the correct diagnosis of this ECG? (1 pt.)



- A. True posterior MI
- B. Extensive Anterior/Anterolateral MI
- C. Inferoposterior MI
- D. Posterolateral MI
- E. Posterolateral MI + LBBB

4. What type of endothelial cell composes the tunica intima? (1 pt.)

5. Answer the following based on a patient whose blood pressure reads: 130/80 mm Hg. (4 pts.)

What does the 80 represent? _____

Calculate the pulse pressure of this patient: _____

Is this a normal pulse pressure? (YES or NO)

What is the clinical threshold for high blood pressure? _____

6. What nerve innervates the heart? (1 pt.)

7. What does it mean if a patient is asystole? (1 pt.)

8. What is the difference between atrial and ventricular fibrillation? (2 pts.)

9. What is a common drug prescribed for angina? Why is this drug used? (2 pts.)

10. Describe the route for pulmonary circulation. (4 pts.)

11. Match the primary functions/descriptions to the appropriate terms listed below. (15 pts.)

	agglutination	A.	circulating cell fragments containing granules; thrombocytes
	albumins	B.	pigmented protein within RBCs which binds/transports gases
	bilirubin	C.	serve to resist pH changes of the blood; carbonic acid/bicarbonate
	buffers	D.	liquid portion of blood
	clotting factors	E.	percentage of erythrocytes out of total blood volume
	coagulation	F.	final stage of hemostasis; conversion of fibrinogen into a fibrin mesh
	erythropoietin	G.	plasma proteins produced by liver that require Vit K; serve in clotting
	fibrinogen	H.	kidney hormone released due to hypoxia; stimulates RBC formation
	fibrinolysis	I.	result of antibodies binding to antigens of mismatched blood type
	globulins	J.	soluble plasma protein required for coagulation
	hematocrit	K.	plasma proteins that contribute to maintenance of osmotic pressure
	hemoglobin	L.	plasma without clotting factors
	plasma	M.	plasma proteins that serve in immunity; i.e. antibodies, complement, etc.
	platelets	N.	orange pigment from the breakdown of hemoglobin; secreted in bile
	serum	O.	process by which clots are dissolved

Tie-Breaker: What is the difference between continuous and fenestrated capillaries?

Anatomy and Physiology Key - B Division

National Science Olympiad State Competition May 16, 2015

Integumentary System

1. Skin makes up what percentage of body weight? (1 pt.)

12-15%

2. Name and describe all layers of epidermis. (10 pts.)

-- cornified layer (*stratum corneum*)

Composed of 10 to 30 layers of polyhedral, anucleated corneocytes (final step of keratinocyte differentiation), with the palms and soles having the most layers. Corneocytes are surrounded by a protein envelope (cornified envelope proteins), filled with water-retaining keratin proteins, attached together through corneodesmosomes and surrounded in the extracellular space by stacked layers of lipids. Most of the barrier functions of the epidermis localize to this layer.

-- clear/translucent layer (*stratum lucidum*, only in palms and soles)

The skin found in the palms and soles is known as "thick skin" because it has 5 epidermal layers instead of 4.

-- granular layer (*stratum granulosum*)

Keratinocytes lose their nuclei and their cytoplasm appears granular. Lipids, contained into those keratinocytes within lamellar bodies, are released into the extracellular space through exocytosis to form a lipid barrier. Those polar lipids are then converted into non-polar lipids and arranged parallel to the cell surface. For example glycosphingolipids become ceramides and phospholipids become free fatty acids.

-- spinous layer (*stratum spinosum*)

Keratinocytes become connected through desmosomes and start produce lamellar bodies, from within the Golgi, enriched in polar lipids, glycosphingolipids, free sterols, phospholipids and catabolic enzymes. Langerhans cells, immunologically active cells, are located in the middle of this layer.

-- basal/germinal layer (*stratum basale/germinativum*).

Composed mainly of proliferating and non-proliferating keratinocytes, attached to the basement membrane by hemidesmosomes. Melanocytes are present, connected to numerous keratinocytes in this and other strata through dendrites. Merkel cells are also found in the stratum basale with large numbers in touch-sensitive sites such as the fingertips and lips. They are closely associated with cutaneous nerves and seem to be involved in light touch sensation

3. What is the stratum corneum, and what type of cell is it made of? (2 pts.)

outermost layer of epidermis; dead cells (corneocytes)

4. In which layer of the skin would you find mechanoreceptors? (1 pt.)

dermis

5. What is the main protein responsible for skin strength and elasticity? (1 pt.)
collagen
6. What are the three major cell types found in the dermis? (3 pts.)
fibroblasts, macrophages, and adipocytes
7. What are the five types of psoriasis? (5 pts.)
plaque, guttate, inverse, pustular, and erythrodermic
8. What type of cell is infected by human papillomavirus? (1 pt.)
keratinocytes of the skin or mucous membranes
9. Name two types of modified apocrine glands in the skin. (2 pts.)
ciliary, ceruminous, and mammary glands

Tie-Breakers:

Which four types of human papillomavirus cause a large number of cervical cancer cases? (up to 4 pts.)

16, 18, 31, 45

What are three major symptoms of psoriasis? (up to 3 pts.)
papules, plaques, and red scaly patches

Immune System

1. Matching: (Items I through V may be used more than once.) (13 pts.)

I. neutrophils II. monocytes III. eosinophils IV. platelets V. basophils

- a. Produced from megakaryoblasts. **D**
- b. Phagocytose antigen-antibody complexes. **C**
- c. Able to kill certain larval parasitic worms. **C**
- d. Largest leukocyte. **B**
- e. A cell fragment. **D**
- f. Leave blood vessels and transform into macrophages. **B**
- g. Nonnucleated structures. **D**
- h. Least abundant leukocyte **E**
- i. Contain ADP and thromboplastin A2. **D**
- j. Granules have an affinity for acidic stains **C**
- k. Some of the contained granules contain heparin **E**
- l. Granules have an affinity for basic stains **E**
- m. Also called thrombocytes **D**

2. What are mast cells? Describe their function. (3 pts.)

a type of innate immune cell that reside in connective tissue and in mucous membranes; intimately associated with wound healing and defense against pathogens, but are also often associated with allergy and anaphylaxis; when activated, mast cells rapidly release characteristic granules, rich in histamine and heparin, along with various hormonal mediators, and chemokines, or chemotactic cytokines into environment; histamine dilates blood vessels, causing inflammation, and recruits neutrophils and macrophages

3. What are the major differences between the innate and adaptive immune systems? (5 pts.)

- innate immune system: non-specific response; exposure leads to immediate maximal response; cell-mediated and humoral components; no immunological memory
- adaptive immune system: pathogen and antigen specific responses; lag time between exposure and maximal response; cell-mediated and humoral components; exposure leads to immunological memory

4. What are the anatomical barriers of the innate immune system? What components of these systems help protect against infection? (8 pts.)

- skin, GI tract, respiratory airways, nasopharynx, eyes
- sweat, desquamation, flushing; peristalsis, gastric acid, bile acids, digestive enzyme, flushing, thiocyanate, defensins, gut flora; mucociliary elevator, surfactant, defensins; mucus, saliva, lysozyme; tears

5. What is autoimmunity? (2 pts.)

failure of the immune system to recognize its constituent parts as itself, leading to immune responses against its own cells and tissues

6. What is erythrocyte sedimentation rate (ESR)? (1 pt.)

the rate at which red blood cells sediment in a period of one hour

7. Match the terms below to their proper definitions. (6 pts.)

D	complement	A.	particle or substance the immune system sees as foreign
F	histamine	B.	proteins produced by plasma cells which have affinity for antigens
E	interferons	C.	fluid recovered from tissues that is filtered by lymph nodes
A	antigen	D.	proteins produced by liver which may be activated by antigens
C	lymph	E.	proteins produced by virally infected cells that activate healthy cells
B	antibody	F.	primary inflammatory chemical released by activated mast cells

8. What autoantibodies are found in a majority of patients with coeliac disease? (1 pt.)
anti-transglutaminase antibodies

Tie-Breaker: What are the secondary causes of T-cell deficiency? (up to 5 pts.)
marrow and other transplants, lymphoma, AIDS, chemotherapy, glucocorticoid therapy

Cardiovascular System

1. What is the correct diagnosis of this ECG? (1 pt.)
inferior MI
2. What is the correct diagnosis of this ECG? (1pt.)
anteroseptal MI
3. What is the correct diagnosis of this ECG? (1 pt.)
extensive anterior/anterolateral MI
4. What type of endothelial cell composes the tunica intima? (1 pt.)
simple squamous

5. Answer the following based on a patient whose blood pressure reads: 130/80 mm Hg.

What does the 80 represent? diastolic pressure (as ventricles relax)

Calculate the pulse pressure of this patient: $130 - 80 = 50$ mm Hg

Is this a normal pulse pressure? YES

What is the clinical threshold for high blood pressure? 140/90 mm Hg (= hypertension)

6. What nerve innervates the heart? (1 pt.)

vagus nerve

7. What does it mean if a patient is asystole? (1 pt.)

no cardiac electrical activity, hence no contractions of the myocardium and no cardiac output or blood flow; “flatline” is not an acceptable response

8. What is the difference between atrial and ventricular fibrillation? (2 pts.)

atrial fibrillation- when the two upper chambers - the atria - contract at an excessively high rate, and in an irregular way

ventricular fibrillation- when the two lower chambers beat irregularly and flutter

9. What is a common drug prescribed for angina? Why is this drug used? (2 pts.)

nitroglycerin; vasodilation

10. Describe the route for pulmonary circulation. (4 pts.)

Deoxygenated blood enters the *right atrium* through the superior vena cava and the inferior vena cava. From the right atrium, the deoxygenated blood drains into the *right ventricle* through the right *atrioventricular (AV) valve*, which is so named because it is between the atrium and the ventricle. This valve is also referred to as the *tricuspid valve* because it has three flaps in its structure. When the ventricles contract, the AV valve closes off the opening between the ventricle and the atrium so that blood does not flow back up into the atrium. As the right ventricle contracts, it forces the deoxygenated blood through the *pulmonary semilunar valve* and into the *pulmonary artery*. *Semilunar* means half-moon and refers to the shape of the valve. Note that this is the only artery in the body that contains deoxygenated blood; all other arteries contain oxygenated blood. The semilunar valve keeps blood from flowing back into the right ventricle once it is in the pulmonary artery. The pulmonary artery carries the blood that is very low in oxygen to the *lungs*, where it becomes oxygenated.

11. Match the primary functions/descriptions to the appropriate terms listed below. (15 pts.)

I	agglutination	A.	circulating cell fragments containing granules; thrombocytes
K	albumins	B.	pigmented protein within RBCs which binds/transport gases
N	bilirubin	C.	serve to resist pH changes of the blood; carbonic acid/bicarbonate
C	buffers	D.	liquid portion of blood

G	clotting factors	E.	percentage of erythrocytes out of total blood volume
F	coagulation	F.	final stage of hemostasis; conversion of fibrinogen into a fibrin mesh
H	erythropoietin	G.	plasma proteins produced by liver that require Vit K; serve in clotting
J	fibrinogen	H.	kidney hormone released due to hypoxia; stimulates RBC formation
O	fibrinolysis	I.	result of antibodies binding to antigens of mismatched blood type
M	globulins	J.	soluble plasma protein required for coagulation
E	hematocrit	K.	plasma proteins that contribute to maintenance of osmotic pressure
B	hemoglobin	L.	plasma without clotting factors
D	plasma	M.	plasma proteins that serve in immunity; i.e. antibodies, complement, etc.
A	platelets	N.	orange pigment from the breakdown of hemoglobin; secreted in bile
L	serum	O.	process by which clots are dissolved

Tie-Breaker: What is the difference between continuous and fenestrated capillaries? (1 pt.)

Fenestrated capillaries (derived from *fenestra*, Latin for "window") have pores in the endothelial cells (60-80 nm in diameter) that are spanned by a diaphragm of radially oriented fibrils and allow small molecules and limited amounts of protein to diffuse



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Station A: Microscopy

Use the **compound microscope**, the **clear mm ruler**, **slide of “PG”**, **Field of View diagram**, and the **photo of Hydra** to assist you in answering the questions.

1. List the total magnification possible for each of the objectives of the compound microscope (**low to high**).
2. As you move from **high** power to **low** power, what happens to the **size of the field of view**, **brightness**, and **depth of focus**? On your answer sheet indicate whether each increases (I) or decreases (D).
3. Using the hands of the clock, a protozoan is observed and appears to be moving **toward 8 o’clock**. What direction is the protozoan actually moving?
4. A student prepares a slide with the letters "**PG**" and positions it on the stage in the normal reading position. When viewed, how will the "**PG**" appear? **Draw it on your answer sheet.**
5. The **working distance** is the space between the objective lens and the slide. Which objective will provide the greatest working distance for this microscope? (list its power) What would be the **total magnification** of this microscope when using **this** objective?
6. **Field of view** is defined as area that is visible with each objective. What **fraction** of the **diameter** a **10X** (low power) field of view is the **diameter** of a **40X** (high power) field of view? What **fraction** of the area of a **10X** (low power) field of view will be visible for a **40X** (high power) field of view?
7. Examine the **Field of View Diagram**. Using this diagram showing the millimeter ruler, what is the diameter of this field of view (**5X** objective) in **millimeters**? in **micrometers or mcm**?
8. Examine the **Photo of the Hydra**. Assume that it was taken in the same field of view (**5X** objective) as the **Field of View Diagram**. What is the length of the **Hydra** without tentacles in **millimeters**? in **micrometers or mcm**?
9. Based upon the **Field of View Diagram** for the **5X objective with the mm ruler**, what should be the diameter of the **10X** field of view in **in millimeters**? in **micrometers or mcm**?
10. If **15** evenly distributed cells are visible in the entire high (**40X**) power field of view, how many cells should be visible in the low (**10X**) power field of view for the same microscope?

Station B: Diagram Analysis

Use the Background Information and Pedigrees P-S to assist you in answering the following questions.

11. Which symbol represents the males? Which symbol represents the females?
12. Which pedigree is **autosomal dominant**? Which pedigree is **sex-linked dominant**?
13. Which pedigree is **autosomal recessive**? Which pedigree is **sex-linked recessive**?
14. In **Pedigree Q**, how are individuals 2 and 4 related?
In **Pedigree R**, how are individuals 4 and 8 related?
15. Which individual from the **II generation** of **Pedigree R** is the oldest?
Which individual is the youngest daughter in **Pedigree S**?

For Questions 16-20 use Key of Genotypes to give the genotype of the Individuals.

KEY of GENOTYPES

- A. AA
- B. AA or Aa
- C. Aa
- D. aa
- E. X^A X^A
- F. X^A X^a
- G. X^a X^a
- H. X^A y
- I. X^a y

For each individual, give the **letter from the KEY OF GENOTYPES** which represents the genotype of that individual from Pedigrees P-S.

For each individual, the letter is the pedigree and number is the individual on the pedigree. (P3)

- | | |
|-------------------|---------------|
| 16. Individual P1 | Individual P4 |
| 17. Individual Q3 | Individual Q4 |
| 18. Individual R1 | Individual R6 |
| 19. Individual R8 | Individual S1 |
| 20. Individual S3 | Individual S6 |

Station C: Experimental Design

For Questions 21-30, use the Background, Experimental Procedure and Data that is provided.

- 21.** What was this study attempting to discover?
- 22.** What plants was used for the study? What apparatus was make for the test?
- 23.** Which Environmental Condition served in the control?
- 24.** Which Environmental Conditions were tested against the control?
- 25.** What were the **independent variable for each test?** How was it measured?
- 26.** What is the **dependent variable?** How is it measured?
- 27.** For how long was each trial conducted and how often were reading taken?
- 28.** Which condition(s) allowed the transpiration rate to stay constant?
- 29.** Which condition(s) caused the transpiration rate to decrease?
What type of errors might the zero reading in the data represent? (random error or experimental error)
- 30.** Which condition(s) caused the transpiration rate to increase?

Station D: Data Interpretation

For Questions 31-40, use the Background, Hypothesis, Procedure Summary and Data on Yeast Respiration in Molasses.

31. According to the hypothesis, what concentration of molasses will give the most growth and carbon dioxide production? Why?
32. Which procedure statement lists the control variables (1, 2, or 3)
In the serial dilution, by how much is each culture reduced?
33. Which concentration is the control? What does it contain?
34. What is the dependent variable and how is it measured?
35. What is the independent variable and how is it measured?
36. Which concentration of molasses resulted in the most carbon dioxide production?
In addition to the nutrients in molasses, what is needed for fermentation and utilization of these nutrients in the growth of the molasses? (hint: what makes up 2/3 of most cells?)
37. Since this lab used a serial dilution, best molasses concentration for yeast growth may not have been one of the solutions. Give a range of solutions that had the best results.
Which 2 solutions had about the same amount of growth?
38. What was there not enough of in the 50 % ?
What was there not enough of in the 0 % ?
39. What would happen to the amount of yeast present in the 5 drops if the yeast suspension was not thoroughly mixed. (**too little or too much**)
If a team failed to do this throughout the setup of the lab, what type of error would it represent? (**experimental, systematic, or random**)
40. Was the hypothesis proven to be true? What important factor was not considered when the hypothesis was made?

Station E: Lab Equipment & Safety

For Questions 41-42, Use the *letters* from the safety symbols chart?

- 41.** What safety symbol is for **fume** safety?
What safety symbol is to **avoid open flames** ?
- 42.** What safety symbol is for **poison** safety?
What safety symbol is for **radioactive material**?

For Questions 43-44, use the list of observed activities in the lab.

- 43.** Which of the observed activities would be considered **safe** and proper for a student's health and safety? **Put the letters of the activities on your answer sheet.**
- 44.** Which of the observed activities would be considered **unsafe** and should **not** be done in the laboratory? **Put the letters of the activities on your answer sheet.**
- 45.** You are performing a timed procedure using the bunsen burner and the fire alarm sounds. **Choose which activities you should do. List the letters in the appropriate order.**
- A. Finish the procedure
 - B. Turn off the gas
 - C. Clean up the lab
 - D. Exit the building as directed.

For Questions 46-50, use the Equipment with Letters.

- 46.** Give the **letter** and **name** of the piece of laboratory equipment which should be used to **grind a piece of salt crystal into a powder**.
- 47.** Give the **letter** and **name** of the piece of laboratory equipment which should be used to **accurately measure the inside diameter of a cylinder**.
- 48.** Give the **letters** of those pieces of laboratory equipment that would be used prepare **a wet mount and observe the pond life it contains**.
- 49.** Give the **letters** of those pieces of laboratory equipment that would be used **culture and observe the feeding habits of planaria**.
- 50.** Give the **letters** of those pieces of laboratory equipment that would be used **to heat 100 ml of a liquid**.

Station F: Measurement

For Questions 51-56, use the metric ruler, graduated cylinder, lab thermometer and material to be measured.

- 51.** What are the **numbered and unnumbered metric increments** for the **metric ruler?** (in centimeters)
- 52.** Determine the **length of critter A** (from A to B) to the tenth of a centimeters? to the whole millimeter?
- 53.** What are the **numbered and unnumbered increments** of the **actual graduated cylinder?**
- 54.** What are the **numbered and unnumbered increments** of the **photo of a graduated cylinder?**
- 55.** What is the **reading** on the **photo** of the graduated cylinder **to the nearest milliliter?**
- 56.** What is the **range** on the lab thermometer (lowest to highest) – 2 parts in photo of same thermometer? What is its temperature reading to the **nearest degree?**

For Questions 57-60, use the triple beam balance, auxillary weights, and the bottle of liquid labeled Object X.

- 57.** What is the **most specific** metric graduation or increment for each beam (**top to bottom**) of the **triple beam balance?**
- 58.** What is the capacity **in grams** of the triple beam balance **without** the weights? What is the capacity **in grams** of the triple beam balance with a full set of weights?
- 59.** What is the actual combined **mass** of the 3 weights in **grams**?
- 60.** What is the mass **in grams** of object X ?

Station G: Cycle Analysis

Use the information provided and perform the requested calculations to supply the requested information.

Round off calculations to the nearest whole number

- 61.** What was the **purpose** of this experiment?
- 62.** What are the three parts of interphase?
- 63.** During which part of interphase does the cell carry on normal cell activities and growth?
During which phase does DNA replicate?
- 64.** What was the **total time** of the cell cycle for a normal cell?
What was the **total time** of the cell cycle for a cancerous cell?
- 65.** Which type of cell spends less time completing a cell cycle? (**Normal or cancer**)
What is the **difference** in total time between the normal life cycle
and the cancerous life cycle?
- 66.** What percent of the cell cycle is spent **in Interphase** for a normal cell?
What percent of the cell cycle is spent **in Interphase** for a cancerous cell?
- 67.** What percent of the cell cycle is spent **in Mitosis** for a **normal cell**?
What percent of the cell cycle is **in Mitosis** for a **cancerous cell**?
- 68.** Which **mitotic phase** showed the **greatest difference** in time between the normal and cancerous cells?
What was the difference between the cancer cell and the normal cell in this phase?
- 69.** How many fewer minutes did the cancer cells spend **in interphase** than the normal cells?
During which part of interphase (**G₁, S, or G₂**) would cancer cells spend less time than
normal cells?
- 70.** What activity of cells is most disrupted in the life cycle of the cancer cell?

Station H: Study Analysis

For Questions 71- 80, Examine the Background and Experimental Data from the Behavioral Study on the Planarian “*Dugesia tigrina*”

71. Where are concentrated receptors in clumps located on the planarian?
Where are the light receptors located?
72. When planaria eat, what brings the partially digested food into the gut?
How does the digestive waste leave the digestive system?
73. Where were most of the planaria located in the test tubes? (top or bottom)
What type of gravitaxis is this? (positive or negative)
74. How did the planaria fight against the force of gravity?
75. How did the planaria respond to the light? (toward or away)
What type of phototaxis is this? (positive or negative)
76. How do the responses of gravity and light work together to protect the planaria?
77. How do the planaria respond to weak salt? (positive or negative)
What does this tell you about their natural environment?
78. How do the planaria respond to weak acid? (positive or negative)
What type of taxis is used to find food? (light, or chemical)
79. How do the planaria respond to weak current? (upstream or downstream)
How might this help them find food?
80. Based upon the results of this environment, what type of environment
is home for the planaria and where do you find them in this environment?

Station I: Ecological Data Analysis

Use the **BACKGROUND INFORMATION, SPECIMENS, DIAGRAMS** and **DATA** to assist you in answering the following questions.

For calculations, **round off to the nearest whole number.**

81. Where are owl pellets stored within the digestive system of the owl?
How are the pellets removed from the body of the owl?
82. Are the owl pellets used in school labs safe for student use? Why?
83. Using the bone sorting chart, identify **skull A**.
Using the bone sorting chart, identify **skull B**.
84. Using the labeled skeleton, identify **bone B**.
Using the labeled skeleton, identify **bone C**.
85. What percent of the animals found by all classes were **rodents**?
What percent of the animals found by all classes were **moles**?
86. What percent of the animals found by all classes were **shrews**?
What percent of the animals found by all classes were **birds**?
87. From the total of all the classes, an average of how many animals were found per pellet?
For which animal type was the biomass the largest?
88. What is **biomass** of **rodents** eaten by the owls whose 85 pellets were studied by all classes?
If one pellet is expelled per day by an owl, how much **rodent biomass** did an owl consume **per day**?
89. A predator expends energy when hunting for food. Which prey is the **most energy efficient** for the owl (rodent, shrew, mole or bird) based upon the biomass of the animals? Which is the **least energy efficient prey**?
90. From the year-long study of the diet of a single Barn Owl, what was the **most common** type of prey?
Which was the **least common** type of prey?

Station J: Observe, Infer & Key

Observations are things you can actually notice using your senses.

Inferences are logical conclusions based upon observations.

For questions 91-95, use the information available from **Specimens A-E.** Indicate whether each is an observation (**O**) or an inference (**I**) using one of the following:

I:I, I:O, O:I, or O:O

- 91.** Specimen B is swimming: Specimen B lives in freshwater
- 92.** Specimen A lives in a desert: Specimen A is nocturnal
- 93.** Specimen E is a good parent: Specimen E has a pungent odor
- 94.** Specimens D & E have white stripe on the head: Specimen C has large claws
- 95.** Specimens C & D have nasty dispositions: Specimens A & C have tan fur on neck

For Questions 96-100, use the **Specimens (A-E)** and the **Dichotomous Key** to answer the following questions.

96. What is specimen **A**?

97. What is specimen **B**?

98. What is specimen **C** ?

99. What is specimen **D** ?

100. What is specimen **E** ?

BIO-PROCESS LAB - DIVISION B**TEAM NUMBER** _____**STATE** _____**SCHOOL** _____**STUDENT NAMES: (PLEASE PRINT)**

1. _____
2. _____

RAW SCORE _____**RANK** _____**POINTS** _____

BE SURE TO INCLUDE APPROPRIATE UNITS WITH ALL ANSWERS!!!

STATION A: Microscopy

1. 40X 100X 400X
 2. I, I, I (all increase)
 3. toward 2 o'clock
 4. (inverted & reversed)
 5. 4X 40X
 6. 1/4 1/16
 7. 3mm 3000 mcm
 8. 1.5 mm 1500 mcm
 9. 1.5 mm 1500 mcm
 10. 240 cells

STATION D: Data Interpretation

31. 50% most energy
 32. 1 half
 33. 0% yeast in pure water
 34. carbon dioxide mL
 35. molasses % solution
 36. 12.5% water
 37. 6.2-12.5% 3.1% & 25%
 38. water food(sugar)
 39. too little systematic
 40. no role of water

STATION B: Diagram Analysis

11. square circle
 12. P R
 13. Q S
 14. father-daughter sisters
 15. 3 8
 16. C D
 17. B D
 18. G I
 19. F F
 20. H I

STATION E: Equipment & Safety

41. N G
 42. K B
 43. C D G I
 44. A B E F H J
 45. B D
 46. D - MORTAR & PESTLE
 47. M - VERNIER CALIPER
 48. J L A
 49. F B
 50. C H K

STATION C: Experimental Design

21. Transpiration rates-4 conditions
 22. 4 bean plants potometer
 23. Normal room setting
 24. light(heat lamp), fan, mist
 25. Time in minutes
 26. water loss in mL/sq.meter
 27. 30 min every 3 min
 28. Normal room setting
 29. mist experimental error
 30. light(heat lamp) & fan

Go to Station F-turn over answer sheet

BIO-PROCESS LAB**STATION F: Measurement**

51.	1 cm	0.1cm
52.	8.9 cm	89 mm
53.	1 mL	0.2 mL
54.	2 mL	0.2 mL
55.	7 mL	
56.	- 20° to 150° C	25° C
57.	10 g	100g
58.	610 g	2610 g
59.	737.5 g	
60.	1035.0 g	

STATION I: Ecology Analysis

81.	<u>proventiculus</u>	<u>regurgitated</u>
82.	<u>yes</u>	<u>fumigated</u>
83.	<u>bird</u>	<u>shrew</u>
84.	<u>pelvic bone</u>	<u>femur</u>
85.	<u>38%</u>	<u>21%</u>
86.	<u>22%</u>	<u>19%</u>
87.	<u>5</u>	<u>bird</u>
88.	<u>3000g</u>	<u>35g/day</u>
89.	<u>bird</u>	<u>shrew</u>
90.	<u>mice</u>	<u>lizard</u>

STATION G: Cycle Analysis

61.	normal vs.	cancer cells
62.	G ₁	S G ₂
63.	G ₁	S
64.	660 min	425 min
65.	cancer	235 min
66.	85%	82%
67.	15%	18%
68.	prophase	20 min
69.	210 min	G ₁
70.	growth & normal metabolic roles	

STATION J: Observe, Infer, Key

91.	O:I
92.	I:I
93.	I:I
94.	O:O
95.	I:O
96.	<i>Mustela trenata</i>
97.	<i>Lutra canadensis</i>
98.	<i>Gulo gulo</i>
99.	<i>Taxidea taxus</i>
100.	<i>Mephitis mephitis</i>

STATION H: Study Analysis

71.	auricles	ocelli
72.	pharynx	pharynx
73.	bottom	positive
74.	along side of tube	
75.	away	negative
76.	bottom -	darker & cooler
77.	negative	freshwater
78.	positive	chemical-acid
79.	upstream -	to odor source
80.	pond or stream	- bottom in shade, attached

Go to Station A-turn over answer sheet

National Science Olympiad 2015 Bottle Rocket B

Number of Teams ----->			60	Flight 1					Flight 2					Scoring and Ranking			Final Score				
Team Number	Team Name (Enter below)	State	Time					Time					Flight 1	Flight 2	Score	Tier	Tiebreaker	Rank	Points		
			1. Rocket free of Constr. Violations	2. Rocket Free of Comp. Violations	3. Timer 1 (in sec)	4. Timer 2 (in sec)	5. Timer 3 (in sec)	6. Rocket free of Constr. Violations	7. Rocket Free of Comp. Violations	8. Timer 1 (in sec)	9. Timer 2 (in sec)	10. Timer 3 (in sec)									
1	Muscatal M.S.	CA	y	y	25.13	26.75	26.00	y	y	25.18	25.32	25.28	1	26.00	1	25.28	51.28	1	0	1	1
2	Winston Churchill M.S.	CA	y	y	15.22	15.22	15.48	y	y	15.22	15.25	15.31	1	15.22	1	15.25	30.47	1	0	20	20
3	Piedmont IB M.S.	NC	y	y	28.97	29.92	29.07	y	y	12.48	12.75	12.69	1	29.07	1	12.69	41.76	1	0	7	7
4	JM Alexander M.S.	NC	y	y	14.68	14.54	14.78	y	y	12.76	13.00	12.69	1	14.68	1	12.76	27.44	1	0	24	24
5	Meads Mill M.S.	MI	y	y	18.50	18.44	18.31	y	y	23.34	23.83	23.75	1	18.44	1	23.75	42.19	1	0	6	6
6	Lakeshore M.S.	MI	y	y	13.02	13.07	13.06	y	y	18.06	18.39	18.34	1	13.06	1	18.34	31.40	1	0	14	14
7	Paul J. Gelinas J.H.S.	NY	y	y	9.38	9.38	9.34	y	y	17.09	17.15	17.19	1	9.38	1	17.15	26.53	1	0	28	28
8	Eagle Hill M.S.	NY	y	y	18.25	18.33	18.25	y	y	20.12	20.25	20.03	1	18.25	1	20.12	38.37	1	0	10	10
9	Daniel Wright J.H.S.	IL	y	y	8.31	8.34	8.50	y	y	4.44	4.43	4.34	1	8.34	1	4.43	12.77	1	0	54	54
10	Marie Murphy	IL	y	y	15.87	15.57	15.69	y	y	19.66	20.00	19.50	1	15.69	1	19.66	35.35	1	0	12	12
11	Springhouse M.S.	PA	y	y	14.28	14.28	14.38	y	y	11.72	11.89	11.81	1	14.28	1	11.81	26.09	1	0	30	30
12	Shady Side Academy M.S.	PA	y	y	11.78	12.35	12.00	y	y	15.37	15.37	15.40	1	12.00	1	15.37	27.37	1	0	25	25
13	Solon M.S.	OH	y	y	21.53	21.25	21.38	y	y	20.22	20.03	20.08	1	21.38	1	20.08	41.46	1	0	8	8
14	Memorial	OH	y	y	16.78	16.69	16.84	y	y	27.81	28.04	27.78	1	16.78	1	27.81	44.59	1	0	5	5
15	Dodgen	GA	y	y	12.60	12.36	12.53	y	y	12.65	12.83	12.75	1	12.53	1	12.75	25.28	1	0	34	34
16	Fulton Science Academy	GA	y	y	19.06	19.64	18.97	y	y	26.03	26.36	26.28	1	19.06	1	26.28	45.34	1	0	3	3
17	Ladue M.S.	MO	y	y	16.38	16.57	16.44	y	y	14.25	14.25	14.37	1	16.44	1	14.25	30.69	1	0	17	17
18	Pembroke Hill M.S.	MO	y	y	8.75	8.62	8.68	y	y	14.81	14.97	14.88	1	8.68	1	14.88	23.56	1	0	38	38
19	Beckendorff J.H.S.	TX	y	y	29.13	29.38	29.13	y	y	16.14	16.10	16.15	1	29.13	1	16.14	45.27	1	0	4	4
20	Cinco Ranch J.H.S.	TX	y	y	15.03	14.87	15.03	y	y	10.94	10.92	10.93	1	15.03	1	10.93	25.96	1	0	31	31
21	Archimedean Middle Conservatory	FL	y	y	17.28	17.27	17.15	y	y	8.06	8.06	7.81	1	17.27	1	8.06	25.33	1	0	33	33
22	Orlando Science School	FL	y	y	16.25	16.22	16.42	y	y	14.41	14.44	14.39	1	16.25	1	14.41	30.66	1	0	18	18
23	Mission M.S.	NE	y	y	3.72	3.61	3.60	y	y	11.34	12.00	11.10	1	3.61	1	11.34	14.95	1	0	52	52
24	Logan Fontenelle M.S.	NE	y	y	17.47	17.65	17.50	y	y	0.00	0.00	0.00	1	17.50	1	0.00	17.50	1	0	47	47
25	Northshore J.H.S.	WA	y	y	7.97	8.02	8.00	y	y	13.25	13.38	13.31	1	8.00	1	13.31	21.31	1	0	42	42

National Science Olympiad 2015 Bottle Rocket B

Number of Teams ----->			60	Flight 1					Flight 2					Scoring and Ranking			Final Score				
Team Number	Team Name (Enter below)	State	Time					Time					Flight 1	Flight 2	Score	Tier	Tiebreaker	Rank	Points		
			1. Rocket free of Constr. Violations	2. Rocket Free of Comp. Violations	3. Timer 1 (in sec)	4. Timer 2 (in sec)	5. Timer 3 (in sec)	6. Rocket free of Constr. Violations	7. Rocket Free of Comp. Violations	8. Timer 1 (in sec)	9. Timer 2 (in sec)	10. Timer 3 (in sec)									
26	Auburn J.H.S.	AL	y	y	19.84	19.80	20.00	y	y	26.29	26.16	26.32	1	19.84	1	26.29	46.13	1	0	2	2
27	Thomas Jefferson M.S.	IN	y	y	14.90	14.78	14.79	y	y	12.67	12.78	12.75	1	14.79	1	12.75	27.54	1	0	23	23
28	Leawood M.S.	KS	y	y	10.19	10.19	10.50	y	y	7.10	7.15	7.21	1	10.19	1	7.15	17.34	1	0	49	49
29	Preston M.S.	CO	y	y	12.63	12.99	12.53	y	y	13.53	13.65	13.44	1	12.63	1	13.53	26.16	1	0	29	29
30	Wachter M.S.	ND	y	y	9.96	9.91	9.93	y	y	12.51	12.72	12.75	1	9.93	1	12.72	22.65	1	0	40	40
31	Longfellow M.S.	VA	y	y	21.25	21.30	21.22	y	y	19.63	19.65	19.62	1	21.25	1	19.63	40.88	1	0	9	9
32	Hamilton M.S.	WI	y	y	15.56	15.55	15.47	y	y	20.65	20.66	20.65	1	15.55	1	20.65	36.20	1	0	11	11
33	Cedar Springs Home School	TN	y	y	11.62	11.62	11.69	y	y	13.12	13.08	12.94	1	11.62	1	13.08	24.70	1	0	36	36
34	Community M.S.	NJ	y	y	16.66	16.81	16.66	y	y	14.44	14.65	14.34	1	16.66	1	14.44	31.10	1	0	16	16
35	Albuquerque Area Home Schoolers	NM	y	y	7.25	7.65	7.40	y	y	6.87	7.22	7.04	1	7.40	1	7.04	14.44	1	0	53	53
36	HB duPont M.S.	DE	y	y	12.09	12.36	11.87	y	y	10.97	10.93	11.00	1	12.09	1	10.97	23.06	1	0	39	39
37	A. W. Coolidge M.S.	MA	y	y	9.56	9.37	9.34	y	y	8.44	8.66	8.13	1	9.37	1	8.44	17.81	1	0	46	46
38	Pilgrimage Homeschool	MD	y	y	12.59	12.69	13.00	y	y	12.44	12.49	12.32	1	12.69	1	12.44	25.13	1	0	35	35
39	Russell Independent M.S.	KY	y	y	15.23	15.03	14.97	y	y	13.78	13.82	13.75	1	15.03	1	13.78	28.81	1	0	22	22
40	Corvallis M.S.	MT	y	y	6.37	6.36	6.37	y	y	0.00	0.00	0.00	1	6.37	1	0.00	6.37	1	0	59	59
41	Paragon Science Academy	AZ	y	y	7.34	6.82	6.87	y	y	11.89	11.50	11.53	1	6.87	1	11.53	18.40	1	0	45	45
42	Fairfield J.H.S.	UT	y	y	16.78	16.80	16.60	y	y	13.62	13.79	13.72	1	16.78	1	13.72	30.50	1	0	19	19
43	Highlands Intermediate School	HI	y	y	12.12	12.28	12.22	y	y	14.53	15.43	14.53	1	12.22	1	14.53	26.75	1	0	27	27
44	Chippewa M.S.	MN	y	y	14.87	14.86	14.75	y	y	12.04	12.59	12.22	1	14.86	1	12.22	27.08	1	0	26	26
45	St. John Berchmans Catholic School	LA	y	y	16.69	16.51	16.56	y	y	14.66	14.72	14.50	1	16.56	1	14.66	31.22	1	0	15	15
46	Saint Patrick Catholic H.S.	MS	y	y	5.44	5.53	5.18	y	y	1.97	2.55	1.85	1	5.44	1	1.97	7.41	1	0	57	57
47	Casady School	OK	y	y	12.06	12.33	12.19	y	y	11.56	11.65	11.50	1	12.19	1	11.56	23.75	1	0	37	37
48	Teeland M.S.	AK	y	y	10.13	10.19	10.07	y	y	7.25	7.56	7.37	1	10.13	1	7.37	17.50	1	-1	48	48
49	Stoller M.S.	OR	y	y	9.69	9.66	9.72	y	y	5.94	5.53	6.54	1	9.69	1	5.94	15.63	1	0	50	50
50	Bell Street M.S.	SC	y	y	11.16	11.28	11.13	y	y	10.64	10.53	10.60	1	11.16	1	10.60	21.76	1	0	41	41

National Science Olympiad 2015 Bottle Rocket B

Number of Teams ----->		60	Flight 1					Flight 2					Scoring and Ranking			Final Score					
Team Number	Team Name (Enter below)	State	1. Rocket free of Constr. Violations		Time			6. Rocket free of Constr. Violations		Time			Flight 1	Flight 2	Score	Tier	Tiebreaker	Rank	Points		
			2. Rocket Free of Comp. Violations	3. Timer 1 (in sec)	4. Timer 2 (in sec)	5. Timer 3 (in sec)	7. Rocket Free of Comp. Violations	8. Timer 1 (in sec)	9. Timer 2 (in sec)	10. Timer 3 (in sec)	11. Bad Sportsmanship (DQ)	Flight 1 Tier	Flight 2 Tier	Flight 2 Time							
51	Bedford M.S.	CT	y	y	19.13	19.01	19.00	y	y	13.22	13.53	13.31	1	19.01	1	13.31	32.32	1	0	13	13
52	St. Joseph's Catholic	ID	y	y	10.06	10.17	10.00	y	y	10.84	10.88	10.72	1	10.06	1	10.84	20.90	1	0	43	43
53	Barrington M.S.	RI	y	y	10.69	10.66	10.60	y	y	15.03	14.81	14.79	1	10.66	1	14.81	25.47	1	0	32	32
54	Hyde Park M.S. - Acad. of Sci. & Math	NV	y	y	10.60	10.80	10.62	y	y	8.33	8.28	8.31	1	10.62	1	8.31	18.93	1	0	44	44
55	Nettleton J.H.S.	AR	y	y	3.78	3.66	3.63	y	y	4.22	4.19	4.19	1	3.66	1	4.19	7.85	1	0	56	56
56	Ames M.S.	IA	y	y	6.78	6.78	6.52	y	y	5.84	5.80	5.88	1	6.78	1	5.84	12.62	1	0	55	55
57	Riverton M.S.	WY	y	y	3.53	3.51	3.63	y	y	3.59	3.25	3.31	1	3.53	1	3.31	6.84	1	0	58	58
58	Yankton M.S.	SD	y	y	13.41	13.65	13.71	y	y	15.81	15.98	15.63	1	13.65	1	15.81	29.46	1	0	21	21
59	Medomak M.S.	ME	y	y	0.00	0.00	0.00	y	y	4.31	4.44	4.60	1	0.00	1	4.44	4.44	1	0	60	60
60	Huntington M.S.	WV	y	y	10.46	10.27	10.59	y	y	5.10	4.96	5.03	1	10.46	1	5.03	15.49	1	0	51	51
61																					
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#	Team Name (State)	Raw Score	Tier	Tie Break	Place	Points
1	Muscatel M.S. (CA)	3891.3			3	3
2	Winston Churchill M.S. (CA)	3205.6			9	9
3	Piedmont IB M.S. (NC)	3035.2			12	12
4	JM Alexander M.S. (NC)	3022.4			13	13
5	Meads Mill M.S. (MI)	2931.3			14	14
6	Lakeshore M.S. (MI)	3397.0			5	5
7	Paul J. Gelinas J.H.S. (NY)	1386.2			36	36
8	Eagle Hill M.S. (NY)	1147.9			42	42
9	Daniel Wright J.H.S. (IL)	4906.4			1	1
10	Marie Murphy (IL)	1932.9			29	29
11	Springhouse M.S. (PA)	2864.0			16	16
12	Shady Side Academy M.S. (PA)	2636.2			18	18
13	Solon M.S. (OH)	3469.7			4	4
14	Memorial (OH)	2313.2			21	21
15	Dodgen (GA)	3251.6			8	8
16	Fulton Science Academy (GA)	2191.3			25	25
17	Ladue M.S. (MO)	1683.9			32	32
18	Pembroke Hill M.S. (MO)	2500.0			20	20
19	Beckendorff J.H.S. (TX)	3075.1			10	10
20	Cinco Ranch J.H.S. (TX)	2245.5			24	24
21	Archimedean Middle Conservatory (FL)	964.5			45	45
22	Orlando Science School (FL)	1587.3			33	33
23	Mission M.S. (NE)	773.2			51	51
24	Logan Fontenelle M.S. (NE)	1037.8			43	43
25	Northshore J.H.S. (WA)	793.2			49	49
26	Auburn J.H.S. (AL)	4336.4			2	2
27	Thomas Jefferson M.S. (IN)	2622.4			19	19
28	Leawood M.S. (KS)	2300.6			22	22
29	Preston M.S. (CO)	766.7			52	52
30	Wachter M.S. (ND)	2152.1			26	26
31	Longfellow M.S. (VA)	2802.6			17	17
32	Hamilton M.S. (WI)	429.5			57	57
33	Cedar Springs Home School (TN)	793.8			48	48
34	Community M.S. (NJ)	3284.9			7	7
35	Albuquerque Area Home Schoolers (NM)	611.3			54	54
36	HB duPont M.S. (DE)	3288.9			6	6
37	A. W. Coolidge M.S. (MA)	1156.2			41	41
38	Pilgrimage Homeschool (MD)	3061.2			11	11
39	Russell Independent M.S. (KY)	1488.8			34	34
40	Corvallis M.S. (MT)	1233.6			39	39
41	Paragon Science Academy (AZ)	2917.9			15	15
42	Fairfield J.H.S. (UT)	1458.0			35	35
43	Highlands Intermediate School (HI)	1971.1			28	28
44	Chippewa M.S. (MN)	1734.9			31	31
45	St. John Berchmans Catholic School (LA)	2276.2			23	23
46	Saint Patrick Catholic H.S. (MS)	304.3			58	58
47	Casady School (OK)	1246.9			38	38
48	Teeland M.S. (AK)	787.8			50	50
49	Stoller M.S. (OR)	1217.7			40	40
50	Bell Street M.S. (SC)	758.9			53	53
51	Bedford M.S. (CT)	1842.2			30	30
52	St. Joseph's Catholic (ID)	924.8			46	46
53	Barrington M.S. (RI)	567.4			55	55
54	Hyde Park M.S. - Acad. of Sci. & Math (NV)	508.7			56	56
55	Nettleton J.H.S. (AR)	186.2			59	59
56	Ames M.S. (IA)	1037.4			44	44
57	Riverton M.S. (WY)	1360.0			37	37
58	Yankton M.S. (SD)	1988.5			27	27
59	Medomak M.S. (ME)	806.9			47	47
60	Huntington M.S. (WV)	150.0			60	60

2015 Science Olympiad National Tournament

SCORE REPORT FORM DIV. B

Event: Bridge Building

Sort Orders	
Scores	High Value Wins
Ties	High Value Wins

Medal Summary				
Place	Team	Score	Tier	Tie
1st	9	4906.4		
2nd	26	4336.4		
3rd	1	3891.3		
4th	13	3469.7		
5th	6	3397.0		
6th	36	3288.9		

INSTRUCTIONS:

- Only fill in the **YELLOW** cells. Everything else is automatic.
- Special codes: "p" for participation, "ns" for no show, "dq" for dq'd (without the quotes) allowed in any column.
- Raw Score column: A red warning box indicates if you have blank scores and haven't put in a special code from above.
- (Optional) Tier column: Tier 1 ranks higher than Tier 2, etc.
- Tie Break column: A red warning box indicates if you have ties and the tied rows are highlighted red. To resolve, fill in those rows with the value from the tie break question.
- Sort Order selectors: use drop down list to set high vs. low wins for raw scores and tie breaks.
- (Optional) Import Data button: use to copy raw scores / tiers / tie breaks from another Excel file
- (Optional) Create Rank sorted button: creates a standalone version of this sheet sorted by rank instead of team number
- Tournament Specific Info:

HQ Phone: 614-570-7251

HQ Location: Abel Hall 1st Floor

Website/Email: soscorer@chalker.org



Can't Judge a Powder
National Tournament 2015



Student Name: _____ (printed)

Student Name: _____ (printed)

School Name: _____

Team Number: _____

Directions for Students:

1. Record your data as you collect it. Any mistakes or changes should be crossed out. Be very neat with your work.
2. As you collect data, place it on the answer sheet sequentially. That means start with the #1. If you need more numbers for data, ask for extra paper and continue numbering the data.
3. Do **not try to change or add any data** once you have moved onto the question sheet you may receive a severe penalty if you do change data.
4. You must wear your goggles and aprons at **ALL** times.

Part I: You **must** use the writing utensil provided for this part. Make all observations on the sheet provided. Make one observation per number. You will have 25 minutes to do this section. You may only write on the line provided for each number. Do not use two numbers for one observation.

Part II: You **must** use the writing utensil provided for this part. Answer all questions by using your observations from Part I. Be sure to write the **number(s) of your observation in the box on the left**. If you do not have an appropriate observation, you may still receive partial credit for answering the question. You will have 20 minutes for this section.

Scoring: Judges ONLY

Points from Part II	
Points from tie breaker.	
Total Points	
Place	

Team Number: _____

	Observations
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Team Number: _____

Questions:

Judge's use ONLY



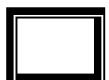
1. What color was the sample?

0 1 2 3 4 5



2. Were the crystals uniform or irregular?

0 1 2 3 4 5



3. Is the sample hygroscopic?

0 1 2 3 4 5



4. Does the sample exhibit luster?

0 1 2 3 4 5



5. What color was the aqueous solution of this powder?

0 1 2 3 4 5



6. Did the powder react with HCl to release a gas?

0 1 2 3 4 5



7. Is the aqueous solution of the powder a non-electrolyte?

0 1 2 3 4 5



8. What was the pH of the distilled water?

0 1 2 3 4 5



9. What was the pH of the aqueous solution of the powder?

0 1 2 3 4 5



10. What was the reaction of the HCl with the aqueous solution?

0 1 2 3 4 5



11. What was the reaction of the NaOH with the aqueous solution?

0 1 2 3 4 5

Team Number: _____



12. Did the aqueous solution of the powder conduct electricity?

0 1 2 3 4 5



13. Was the sample more or less dense than water?

0 1 2 3 4 5



14. Was the aqueous solution of the powder acidic?

0 1 2 3 4 5



15. Was the sample very soluble, insoluble or slightly soluble in water?

0 1 2 3 4 5



16. Was there a gas given off when the aqueous sample was mixed with NaOH?

0 1 2 3 4 5



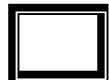
17. Did the aqueous sample react with Benedict's solution?

0 1 2 3 4 5



18. Is the powder magnetic?

0 1 2 3 4 5



19. Was the sample ionic?

0 1 2 3 4 5



20. Was the reaction of the powder and water endothermic?

0 1 2 3 4 5



21. If a gas was produced, what was the pH of the gas?

0 1 2 3 4 5



22. Is the powder a hydrate?

0 1 2 3 4 5

Team Number: _____



23. What was the mass of the powder and the cup?

0 1 2 3 4 5



24. What was the temperature of the distilled H₂O?

0 1 2 3 4 5



25. Does a solution of the powder and water give off an odor?

0 1 2 3 4 5

Notes for Students

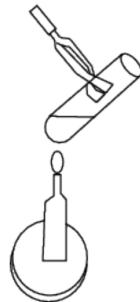
Magnet: Place a small amount of the powder in a small test tube and drag the magnet along the test tube side. Make observations.

Benedict's Solution: Add 5 drops to an aqueous solution of the powder. Make Observations.

Thermometer: Remove thermometer from the case. Place thermometer in the solution and observe the temperature. Do not take the temperature of the HCl, NaOH, or Benedict's Solution.

Balance: Tare (zero) the balance before using it.

Test tube and Candle: Place a small amount of the powder in the small test tube. Attach a test tube holder to the open end of the test tube. **Wave** the test tube over the candle flame for about 10 seconds. Make observations.





Can't Judge a Powder National Tournament 2015



Student Name: _____ **Answer Key** _____ (printed)

Student Name: _____ (printed)

School Name: _____

Team Number: _____

Directions for Students:

1. Record your data as you collect it. Any mistakes or changes should be crossed out. Be very neat with your work.
2. As you collect data, place it on the answer sheet sequentially. That means start with the #1. If you need more numbers for data, ask for extra paper and continue numbering the data.
3. Do **not try to change or add any data** once you have moved onto the question sheet you may receive a severe penalty if you do change data.
4. You must wear your goggles and aprons at **ALL** times.

Part I: You **must** use the writing utensil provided for this part. Make all observations on the sheet provided. Make one observation per number. You will have 25 minutes to do this section. You may only write on the line provided for each number. Do not use two numbers for one observation.

Part II: You **must** use the writing utensil provided for this part. Answer all questions by using your observations from Part I. Be sure to write the **number(s) of your observation in the box on the left**. If you do not have an appropriate observation, you may still receive partial credit for answering the question. You will have 20 minutes for this section.

Scoring: Judges ONLY

Points from

Part II

Points from

tie breaker.

Total Points **125 pts**

Place

Team Number: _____

Questions:

Judge's use ONLY

1. What color was the sample?
_____ White _____ 0 1 2 3 4 5
2. Were the crystals uniform or irregular?
_____ uniform _____ 0 1 2 3 4 5
3. Is the sample hygroscopic?
_____ yes _____ 0 1 2 3 4 5
4. Does the sample exhibit luster?
_____ no _____ 0 1 2 3 4 5
5. What color was the aqueous solution of this powder?
_____ clear, somewhat cloudy is too much added _____ 0 1 2 3 4 5
6. Did the powder react with HCl to release a gas?
_____ yes _____ 0 1 2 3 4 5
7. Is the aqueous solution of powder a non-electrolyte?
_____ No _____ 0 1 2 3 4 5
8. What was the pH of the distilled water?
_____ 6 _____ 0 1 2 3 4 5
9. What was the pH of the aqueous solution of the powder?
_____ approximately 10 _____ 0 1 2 3 4 5
10. What was the reaction of the HCl with the aqueous solution?
_____ gas released _____ 0 1 2 3 4 5
11. What was the reaction of the NaOH with the aqueous solution?
_____ none _____ 0 1 2 3 4 5

Team Number: _____



12. Did the aqueous solution of the powder conduct electricity?

yes

0 1 2 3 4 5



13. Was the sample more or less dense than water?

more

0 1 2 3 4 5



14. Was the aqueous solution of the powder acidic?

no

0 1 2 3 4 5



15. Was the sample very soluble, insoluble or slightly soluble in water?

very

0 1 2 3 4 5



16. Was there a gas given off when the aqueous sample was mixed with NaOH?

no

0 1 2 3 4 5



17. Did the aqueous sample react with Benedict's solution?

no

0 1 2 3 4 5



18. Is the powder magnetic?

no

0 1 2 3 4 5



19. Was the sample ionic?

yes

0 1 2 3 4 5



20. Was the reaction of the powder and water endothermic?

no

0 1 2 3 4 5



21. If a gas was produced, what was the pH of the gas?

acidic range

0 1 2 3 4 5



22. Is the powder a hydrate?

yes

0 1 2 3 4 5

Team Number: ____



23. What was the mass of the powder and the cup?

_____ **answers will vary** _____

0 1 2 3 4 5



24. What was the temperature of the distilled H₂O?

_____ **AWV based on room temp; if sig figed then 5 pts** _____

0 1 2 3 4 5



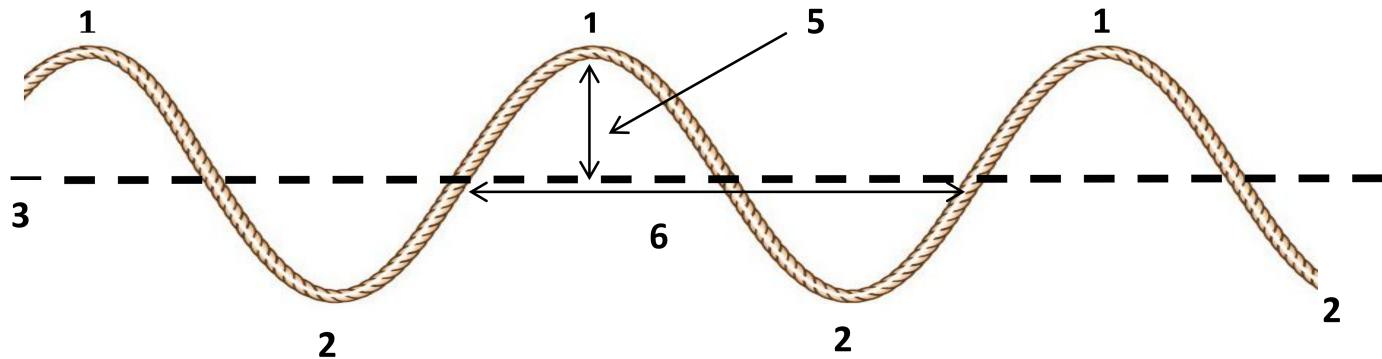
25. Does a solution of the powder and water give off an odor?

_____ **no** _____

0 1 2 3 4 5

STATION 1

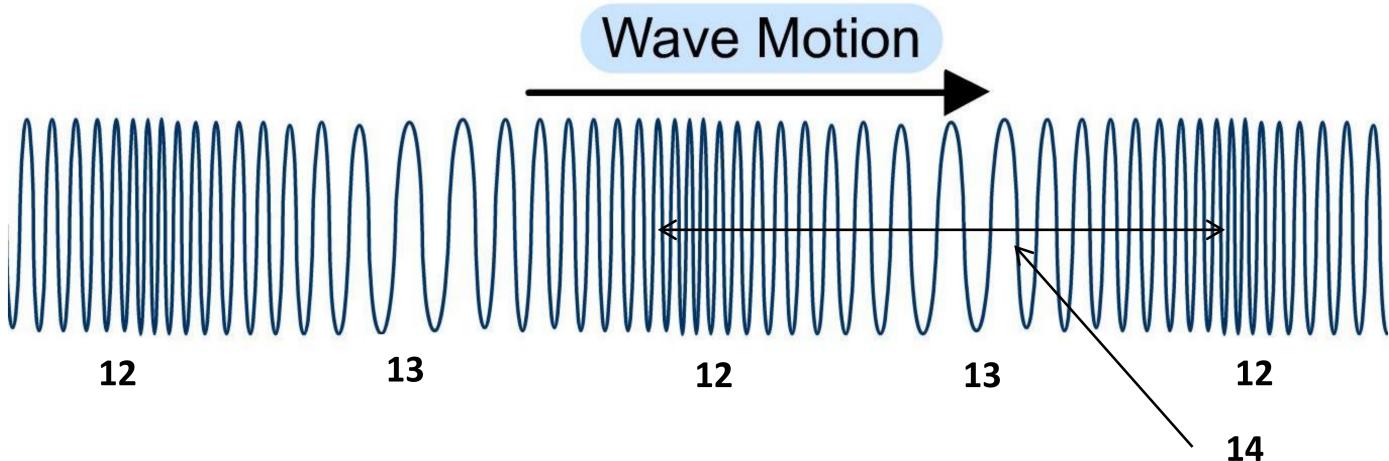
Identify the following parts of a wave and answer the following questions



7. What type of wave is this? (transverse, longitudinal, surface, torsional)
8. What is the SI unit for (6) above?
9. What is the term given to the number of wave points (same wave point) that crosses a specific period in one second?
10. What is the SI unit for the term described in (9)?
11. Give one real-world example of the type of wave shown above.

Station 2

Identify the following parts of a wave and answer the following questions



15. What type of wave is this? (transverse, longitudinal, surface, torsional)
16. What is the SI unit for (14) above?
17. Give one real-world example of this type of wave.
18. Vibrations often cause these type of waves. Vibrations also, through use of these waves, transfer what type of energy and can be recognized by humans?
19. What is the SI unit for the period of a wave?
20. How is the period of a wave related to its frequency?
21. What is the mathematical relationship (equation) that relates the velocity of a wave to its frequency and wavelength?
22. If a wave has a frequency of 30 hertz and a wavelength of 1 meter, what is the speed of the wave?

Station 3

Use the provided tools to complete all of the questions at this station.

23. Copy an outline of the plastic block into the space provided on your answer sheet.
Draw an incident light ray on one of the long sides of the block.

24. Draw a normal line to the incident ray through the block – make this line dashed

25. Draw the refracted light onto the paper by looking through the block and using the provided tools.

26. Draw the exiting light ray on the other side of the block

27. Label all angles on your paper

28. Calculate the index of refraction for this material.

29. Identify the material presented here.

30. Identify a source of error that may have greatly affected your results and what you would do differently next time to reduce that error.

Station 4

31. _____ is the bending of light around a corner.
32. _____ is the bending of light as it passes through a different medium
33. _____ is the throwing or bending back of light from a surface
34. Give an example of a divergent mirror.
35. Give an example of a convergent lens.
36. Define a real image and contrast it with a virtual image.
37. Classify the following mirrors as concave or convex: A, B, C, D
38. Classify the following lenses as concave or convex: E, F, G, H
39. Give a real world application of a convex mirror.

Station 5

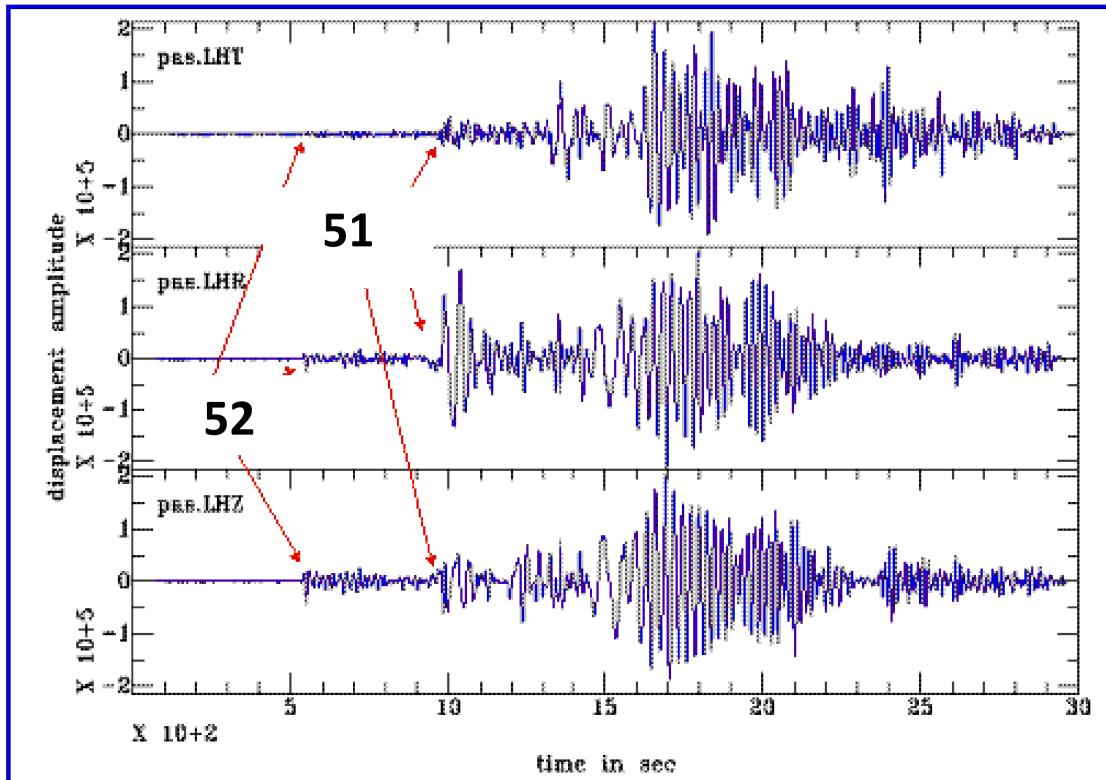
Use the provided sound files to answer the following questions

40. For the first part of Clip 1, is the vehicle moving towards or away from you?
41. For the second part of Clip 1, is the vehicle moving towards or away from you?
42. For the first part of Clip 2, is the vehicle moving towards or away from you?
43. For the second part of Clip 2, is the vehicle moving towards or away from you?
44. For the first part of Clip 3, is the vehicle moving towards or away from you?
45. For the second part of Clip 3, is the vehicle moving towards or away from you?

46. Which vehicle seems to be moving the fastest, the one in Clip 1, Clip 2, Clip 3, or Clip 4?
47. Which vehicle seems to be moving the second fastest, the one in Clip 1, Clip 2, Clip 3, or Clip 4?
48. Which vehicle seems to be moving the third fastest, the one in Clip 1, Clip 2, Clip 3, or Clip 4?
49. Which vehicle seems to be moving the slowest, the one in Clip 1, Clip 2, Clip 3, or Clip 4?
50. What is the name of the phenomena witnessed in each of these sound clips?

Station 6

Use the provided information below to answer the following questions



51. What type of wave is (51) pointing at above?
52. What type of wave is (52) pointing at above?
53. Calculate the S-P Interval for the top graph.
54. Calculate the S-P Interval for the middle graph.
55. Calculate the S-P Interval for the middle graph.
56. Body waves include what two types of waves?
57. Surface waves include what two types of waves?
58. Wave velocity tends to _____ as surface depth increases (below the surface)